PETROS KOUMOUTSAKOS

EDUCATION

1993: *California Institute of Technology*, **Ph.D.,** *Aeronautics and Applied Mathematics*
1988: *California Institute of Technology* **M.Sc**., *Aeronautics*
1987: *University of Michigan, Ann Arbor*, **M.Sc**., *Naval Architecture*
1986: *National Technical University of Athens, Greece,* **Diploma***, Naval Architecture*

ACADEMIC APPOINTMENTS

2021- *Harvard University*,
Chair, Department of Applied Mathematics
Director, Institute of Applied Computational Science
Gordon McKay Professor for Computing in Science and Engineering
2000-2020: *ETH Zürich*, Professorship for Computational Science
2016-2020: *Collegium Helveticum*, Fellow
1997-2000: *ETH Zürich*, Assistant Professor of Computational Fluid Dynamics
1996-2001: *NASA Ames*, Research Associate
1994-1996: *Stanford University*, Center for Turbulence Research, Post-doc Fellow
1993-1994: *California Institute of Technology,* Center for Parallel Computing, Post-doc Fellow

VISITING POSITIONS

2016-2017: *Radcliffe Institute of Advanced Study, Harvard University*, Fellow
2016-2017: *Massachusetts Institute of Technology*, Visiting Professor
2016, 2017, 2018: *California Institute of Technology,* Moore Distinguished Scholar (6 months)
2009-2015: *California Institute of Technology,* Millikan Visiting Professor (18 months)
2014: *UT Austin*, Tinsley Oden Visiting Professor (2 months)
2005: *University of Tokyo*, Visiting Professor

HONORS - AWARDS (selected)

Hall of Fame of the Digital Age, Zuse Institute Berlin, Germany, *2019*
Foreign Member, National Academy of Engineering (NAE), USA*, 2018*
Moore Distinguished Scholar Award, California Institute of Technology, USA, *2016-2019*
Distinguished Affiliated Professor, TU Munich, Germany, *2018*
Einstein Fellow, Freie Universität Berlin, Germany, *2018*
William and Flora Hewlett Foundation Fellow, Harvard University, USA, *2016-2017*
Wallace Fellow, Massachusetts Institute of Technology, USA, *2016-2017*
Fellow, Society of Industrial and Applied Mathematics (SIAM-*2015),* American Physical Society (APS-2012),American Society of Mechanical Engineers (ASME -*2012)*
Gordon Bell Award Winner (2013), Finalist (2015), Association of Computing Machinery (ACM)
Advanced Investigator Award, European Research Council (ERC), *2013*
Fellow, Fellow, University of Tokyo, Japan, *2007*
Gallery of Fluid Motion Awards, American Physical Society (APS), *1995, 2000, 2007, 2012, 2019*

ADMINISTRATION (selected)

Member, Board on Mathematical Sciences and Analytics, US National Academies of Sciences, Engineering and Medicine
Chair of the Access Committee (2016-2020), Chair of the Scientific Steering Committee (2015-2016), Partnership for Advanced Computing in Europe (PRACE)
Founder and co-Director, Zurich Graduate School in Computational Science, 2014-2016
Advisory Board, Akademie Schloss Solitude, Germany, (2011-2015)
Director, NVIDIA CUDA Research Center, 2011-
Founder and Director, ETH Zürich, Computational Laboratory (ETHZ CoLab), 2001-2007
Founder and Director, ETH Zürich, Institute of Computational Science (ICoS)*,* 2000-2005

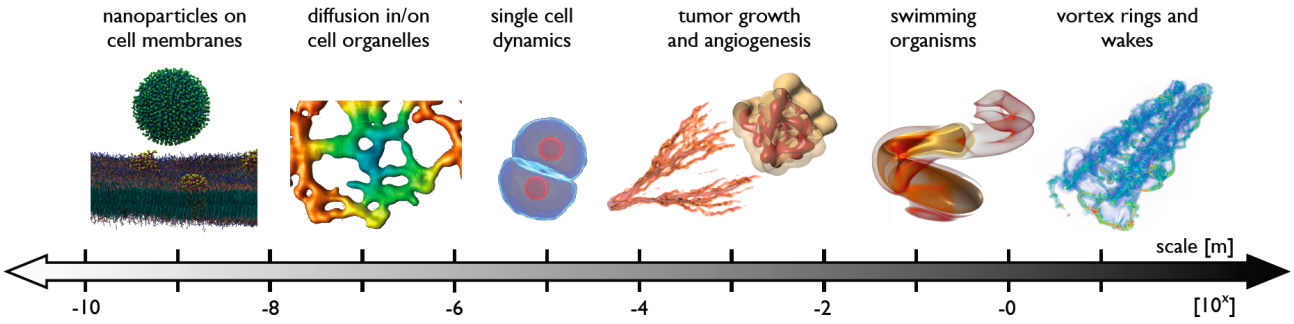
EDITORIAL BOARDS

Phys. Rev. Fluids (2018-), Comput. Phys. Commun. (2019-), J. Comput. Phys. (2010-2016), J. of Comp. and Theor. Nanoscience, Computational Particle Mechanics (2014-2017), J. Computational Science (2013-2017) Mathematics, Modeling and Simulation in Science, Engineering, Technology (Springer Book series).

MAJOR SCIENTIFIC CONTRIBUTIONS

Contributions in Computational Science, Fluid Mechanics, Nanotechnology, Biology and their Interfaces.

- ***Computational Science/Numerical Methods:*** multiscale particle methods, multiresolution adapted grids, coupling of atomistic and continuum descriptions, accelerated stochastic simulations.
- ***Computational Science/Computer Science*****:** High Performance Computing (petascale simulations of two-phase flows (Gordon Bell award 2013),. Algorithms for Bio-inspired Optimization and its coupling with Machine Learning. Uncertainty Quantification for complex systems. Large scale Visualisations. Open source software in particle methods, optimisation, imaging and uncertainty quantification.
- ***Fluid Mechanics:*** Benchmark simulations of bluff body flows and high Re number vortex reconnection. Optimisation of swimmers demonstrated that fish escape patterns in nature are optimal.
- ***Nanotechnology:*** State of the art simulation of water interactions with graphene and carbon nanotubes. We devised validated interaction potentials that are considered the standard in the community. Large scale simulation of Nanofluidics, nanotube membrane interactions and nanoscale wetting.
- ***Biology:*** Pioneering simulations of diffusion in image reconstructed cell organelles, led to reevaluation of diffusion constants of several molecules in biology. Presented the first 3D simulations of angiogenesis inside an extracellular matrix. Extensive, open source, image and video analysis software for Biologists.



Examples from our state of the art, interdisciplinary simulations spanning a multitude of spatiotemporal scales.

INVITED KEYNOTE PRESENTATIONS (2010-2019, selected)

- The Lighhill Lecture, Imperial College, London, UK, 23/9/2020
- MIT and Alan Turing Institute International Workshop on Data-Centric Engineering, Cambridge, USA, 12/9-12, 2019
- EECS Colloquium, UC Berkeley, USA, 10/30, 2019
- IPAM Workshop III: Validation and Guarantees in Learning Physical Models: from Patterns to Governing Equations to Laws of Nature, Los Angeles, USA, 10/28-11/1, 2019
- American Physical Society, Division of Fluid Dynamics Conference, Seattle, USA, 11/23-26, 2019
- IPAM Workshop III: HPC for Computationally and Data-Intensive Problems, Los Angeles, USA - 11/5-9, 2018
- High Performance Computing in Life sciences, Engineering, And Physics (HPC-LEAP), London, UK, 7/11-13, 2018
- IUTAM Symposium on Critical flow dynamics involving moving/deformable structures with design applications, Santorini, Greece, 6/18-22, 2018
- International Conference on Computational Science (ICCS), Wuxi, China, 6/1-3, 2018
- SIAM Conference on Parallel Processing for Scientific Computing, Tokyo, Japan, 3/7-10, 2018
- Supercomputing Frontiers Europe, Warsaw, Poland, 3/12-15, 2018
- IUTAM Symposium on Computational Mechanics of Particle-Functionalized Fluid and Solid Materials for Additive Manufacturing and 3D Printing Processes, Berkeley, USA, 5/30-31, 2017

- Predictive Multi-scale Materials Modeling, Issac Newton Institute, Cambridge, 12/1-4, 2015
- International Conference on Computational Science (ICCS), Reykjavik, Iceland, 6/1-3, 2015
- International Conference on Particle Based Methods, Barcelona, 28-30/9, 2015
- American Physical Society, Division of Fluid Dynamics Conference, San Francisco, 11/25-28, 2014
- SIAM Conference in Parallel Processing and Scientific Computing, Oregon, 2/18-22, 2014
- ACM Supercomputing 2013, Denver, USA, 11/20-23, 2013
- Von Neumann Colloquium of the American Mathematical Society, Snowbird, 2011
- International Conference in CFD, Saint Petersburg, 2010
- European Fluid Mechanics Conference (EFMC8), Munich, 2010

ORGANIZATION OF CONFERENCES AND WORKSHOPS (selected)

2021: European Fluid Mechanics and Turbulence Conference (EFMTC2021), Zurich, Switzerland
2019: Causality and Dynamics Workshop, Radcliffe Institute for Advanced Study, Cambridge, USA
2017: International Conference on Computational Science (ICCS), Zurich, Switzerland
2016: PRACE Days, Prague, Czech Republic
2016: Fluid Mechanics and Collective Behavior, Monte Verita, Switzerland
2015: 2nd Frontiers in Computational Physics Conference: Energy, Zurich, Switzerland
2014, 2015: Partnership for Advanced Scientific Computing, Switzerland
2005, 2008: School in Multiscale Modeling and Simulation, (Lugano, Zurich)
2007: 6th International Congress on Industrial and Applied Mathematics, ICIAM07, Zurich,
2000-present: Several conferences/summer schools for ERCOFTAC, ECCOMAS, EUROGEN

PUBLICATIONS

Links to: ORCID, ResearcherID:A-2846-2008, Google Scholar

MONOGRAPH

1. *G. Cottet, and P. Koumoutsakos*, Vortex Methods: Theory and Practice**, Cambridge University Press,** 2000.

EDITED VOLUMES (selected)

1. *J. Lipkova, D. Rossinelli, P. Koumoutsakos, J. Lowengrub, and B. Menze (chapter)*, "Peak of the iceberg," in **The art of theoretical biology**, Springer, 2020, p. 18–19.
2. *J. Lipkova, D. Rossinelli, P. Koumoutsakos, and B. Menze (chapter)*, "Out of the comfort zone," in **The art of theoretical biology**, Springer, 2020, pp. 110-111.
3. *F. Cailliez, P. Pernot, F. Rizzi, R. Jones, O. Knio, G. Arampatzis, and P. Koumoutsakos (chapter)*, "Bayesian calibration of force fields for molecular simulations," in **Uncertainty quantification in multiscale materials modeling**, Elsevier, 2020, pp. 169-277.
4. *M. Bergdorf, F. Milde, and P. Koumoutsakos (chapter),* "Particle simulations of growth: application to tumorigenesis," in **Modeling tumor vasculature**, Springer, 2011, p. 261–303.
5. *F. Milde, M. Bergdorf, and P. Koumoutsakos (chapter)*, "Particle simulations of growth: application to angiogenesis," in **Modeling tumor vasculature**, Springer, 2011, p. 305–334.
6. *M. Bergdorf, F. Milde, and P. Koumoutsakos (chapter)*, "Continuum models of mesenchymal cell migration and sprouting angiogenesis," in **Multiscale cancer modeling**, CRC Press, 2010, p. 213–235.
7. *P. Koumoutsakos (chapter),* "Multiscale modeling and simulation for fluid mechanics at the nanoscale," in **Carbon nanotube devices: properties, modeling, integration and applications,** Wiley Online Library, 2008, p. 229–290.
8. *P. Koumoutsakos, and I. Mezic (editors),* **Control of Fluid Flow**, Lect. Notes Contr. Inf., Springer, 2006.
9. *T. Hou, and Koumoutsakos P. (editors)*, Special Section on Multiscale Modeling and Simulation in Materials and Life Sciences, **SIAM Multiscale Model. Sim.**, 2005.
10. *S. Attinger, and P. Koumoutsakos (editors)*, **Multiscale Modelling and Simulation**, Lect. Notes Comp. Sci., Springer, 2004.
11. *E. Meiburg, G. Cottet, A. Ghoniem, and P. Koumoutsakos (editors)*, **Proceedings of the Fourth International Workshop on Vortex Flows and Related Numerical Methods**, IOP Publishing Ltd., 2002.
12. *A. Gyr, P. Koumoutsakos, and U. Burr (editors)*, **Science and Art Symposium 2000**, Springer, 2000.

JOURNAL PAPERS

1. *G. Novati, H. L. de Laroussilhe, and P. Koumoutsakos,* "Automating turbulence modelling by multi-agent reinforcement learning," **Nature Mach. Intell.**, 2021.
2. *A. Economides, G. Arampatzis, D. Alexeev, S. Litvinov, L. Amoudruz, L. Kulakova, C. Papadimitriou, and P. Koumoutsakos*, "Hierarchical bayesian uncertainty quantification for a model of the red blood cell," **Phys. Rev. Appl**., vol. 15, iss. 3, 2021.
3. *K. Larson, G. Arampatzis, C. Bowman, Z. Chen, P. Hadjidoukas, C. Papadimitriou, P. Koumoutsakos, and A. Matzavinos*, "Data-driven prediction and origin identification of epidemics in population networks," **Roy. Soc. Open Sci.,** vol. 8, iss. 1, p. 200531, 2021.
4. *A. Khosronejad, S. Kang, F. Wermelinger, P. Koumoutsakos, and F. Sotiropoulos*, "A computational study of expiratory particle transport and vortex dynamics during breathing with and without face masks," **Physics of fluids**, vol. 33, iss. 6, p. 66605, 2021.
5. *P. Karnakov, G. Arampatzis, I. Kičić, F. Wermelinger, D. Wälchli, C. Papadimitriou, and P. Koumoutsakos*, "Data-driven inference of the reproduction number for COVID-19 before and after interventions for 51 European countries," **Swiss Medical Weekly**, iss. 150:w20313, 2020.
6. *D. Alexeev, L. Amoudruz, S. Litvinov, and P. Koumoutsakos*, "Mirheo: high-performance mesoscale simulations for microfluidics," **Comput. Phys. Commun**., p. 107298, 2020.
7. *Z. Y. Wan, P. Karnakov, P. Koumoutsakos, and T. P. Sapsis*, "Bubbles in turbulent flows: data-driven, kinematic models with history terms," **Int. J. Multiphas. Flow**, vol. 129, p. 103286, 2020.
8. *P. Weber, G. Arampatzis, G. Novati, S. Verma, C. Papadimitriou, and P. Koumoutsakos*, "Optimal flow sensing for schooling swimmers," **Biomimetics**, vol. 5, iss. 1, 2020*D. Alexeev, L. Amoudruz, S. Litvinov, and P. Koumoutsakos*, "Mirheo: high-performance mesoscale simulations for microfluidics," **Comput. Phys. Commun.**, p. 107298, 2020.
9. *X. Bian, S. Litvinov, and P. Koumoutsakos*, "Bending models of lipid bilayer membranes: spontaneous curvature and area-difference elasticity," **Comput. Method. Appl. M.**, vol. 359, p. 112758, 2020.
10. *S. L. Brunton, B. R. Noack, and P. Koumoutsakos*, "Machine learning for fluid mechanics," **Annu. Rev. Fluid Mech.**, vol. 52, iss. 1, p. 477–508, 2020.
11. *P. Karnakov, S. Litvinov, and P. Koumoutsakos*, "A hybrid particle volume-of-fluid method for curvature estimation in multiphase flows," **Int. J. Multiphas. Flow**, vol. 125, p. 103209, 2020.
12. *P. R. Vlachas, J. Pathak, B. R. Hunt, T. P. Sapsis, M. Girvan, E. Ott, and P. Koumoutsakos*, "Backpropagation algorithms and reservoir computing in recurrent neural networks for the forecasting of complex spatiotemporal dynamics," **Neural Networks**, vol. 126, pp. 191-217, 2020.
13. *P. Weber, G. Arampatzis, G. Novati, S. Verma, C. Papadimitriou, and P. Koumoutsakos,* "Optimal flow sensing for schooling swimmers," **Biomimetics**, vol. 5, iss. 1, 2020.
14. *W. Byeon, M. Domínguez-Rodrigo, G. Arampatzis, E. Baquedano, J. Yravedra, M. A. Maté-González, and P. Koumoutsakos*, "Automated identification and deep classification of cut marks on bones and its paleoanthropological implications," **J. Comput. Sci.-NETH.**, vol. 32, pp. 36-43, 2019.
15. *C. Dietsche, B. R. Mutlu, J. F. Edd, P. Koumoutsakos, and M. Toner*, "Dynamic particle ordering in oscillatory inertial microfluidics," **Microfluid. Nanofluid.**, vol. 23, iss. 6, 2019.
16. *S. M. H. Hashemi, P. Karnakov, P. Hadikhani, E. Chinello, S. Litvinov, C. Moser, P. Koumoutsakos, and D. Psaltis*, "A versatile and membrane-less electrochemical reactor for the electrolysis of water and brine," **Energ. Environ. Sci.**, 2019.
17. *K. Larson, C. Bowman, C. Papadimitriou, P. Koumoutsakos, and A. Matzavinos*, "Detection of arterial wall abnormalities via bayesian model selection," **Roy. Soc. Open Sci.**, vol. 6, iss. 10, p. 182229, 2019.
18. *J. Lipková, P. Angelikopoulos, S. Wu, E. Alberts, B. Wiestler, C. Diehl, C. Preibisch, T. Pyka, S. Combs, P. Hadjidoukas, K. V. Leemput, P. Koumoutsakos, J. Lowengrub, and B. Menze*, "Personalized radiotherapy design for glioblastoma: integrating mathematical tumor models, multimodal scans and bayesian inference," **IEEE T. Med. Imaging**, p. 1–1, 2019.
19. *G. Novati, L. Mahadevan, and P. Koumoutsakos,* "Controlled gliding and perching through deep-reinforcement-learning," **Phys. Rev. Fluids**, vol. 4, iss. 9, 2019.
20. *E. Papadopoulou, C. M. Megaridis, J. H. Walther, and P. Koumoutsakos*, "Ultrafast propulsion of water nanodroplets on patterned graphene," **ACS Nano**, 2019.
21. *U. Rasthofer, F. Wermelinger, P. Karnakov, J. Šukys, and P. Koumoutsakos*, "Computational study of the collapse of a cloud with 12500 gas bubbles in a liquid," **Phys. Rev. Fluids**, vol. 4, p. 63602, 2019.
22. *S. Verma, C. Papadimitriou, N. Luethen, G. Arampatzis, and P. Koumoutsakos*, "Optimal sensor placement for artificial swimmers," **J. Fluid Mech.**, vol. 884, 2019.

23. *J. Zavadlav, G. Arampatzis, and P. Koumoutsakos*, "Bayesian selection for coarse-grained models of liquid water," **Sci. Rep.-UK**, vol. 9, iss. 1, 2019.
24. *G. Arampatzis, D. Waelchli, P. Angelikopoulos, S. Wu, P. Hadjidoukas, and P. Koumoutsakos*, "Langevin diffusion for population based sampling with an application in bayesian inference for pharmacodynamics," **SIAM J. Sci. Comput.**, vol. 40, iss. 3, p. B788–B811, 2018.
25. *J. Lipková, G. Arampatzis, P. Chatelain, B. Menze, and P. Koumoutsakos*, "S-leaping: an adaptive, accelerated stochastic simulation algorithm, bridging τ-leaping and r-leaping," **B. Math. Biol.**, 2018.
26. *S. Verma, G. Novati, and P. Koumoutsakos*, "Efficient collective swimming by harnessing vortices through deep reinforcement learning," **P. Natl. Acad. Sci. USA**, p. 201800923, 2018.
27. *P. R. Vlachas, W. Byeon, Z. Y. Wan, T. P. Sapsis, and P. Koumoutsakos*, "Data-driven forecasting of high-dimensional chaotic systems with long short-term memory networks," **P. Roy. Soc. A-Math. Phy.**, vol. 474, iss. 2213, p. 20170844, 2018.
28. *Z. Y. Wan, P. R. Vlachas, P. Koumoutsakos, and T. P. Sapsis*, "Data-assisted reduced-order modeling of extreme events in complex dynamical systems," **PLoS ONE**, vol. 13, iss. 5, pp. 1-22, 2018.
29. *F. Wermelinger, U. Rasthofer, P. E. Hadjidoukas, and P. Koumoutsakos,* "Petascale simulations of compressible flows with interfaces," **J. Comput. Sci.-NETH.**, vol. 26, p. 217–225, 2018.
30. *S. Wu, P. Angelikopoulos, J. L. Beck, and P. Koumoutsakos*, "Hierarchical stochastic model in bayesian inference for engineering applications: theoretical implications and efficient approximation, **ASCE-ASME J. Risk Uncertain. Eng. Sys. B**, vol. 5, iss. 1, p. 11006, 2018.
31. *J. Šukys, U. Rasthofer, F. Wermelinger, P. Hadjidoukas, and P. Koumoutsakos*, "Multilevel control variates for uncertainty quantification in simulations of cloud cavitation," **SIAM J. Sci. Comput.**, vol. 40, iss. 5, p. B1361–B1390, 2018.
32. *E. R. Cruz-Chú, E. Papadopoulou, J. H. Walther, A. Popadić, G. Li, M. Praprotnik, and P. Koumoutsakos*, "On phonons and water flow enhancement in carbon nanotubes," **Nat. Nanotechnol.** vol. 12, iss. 12, p. 1106–1108, 2017.
33. *N. Karathanasopoulos, P. Angelikopoulos, C. Papadimitriou, and P. Koumoutsakos*, "Bayesian identification of the tendon fascicle's structural composition using finite element models for helical geometries," **Comput. Method. Appl. M.**, vol. 313, p. 744–758, 2017.
34. *L. Kulakova, G. Arampatzis, P. Angelikopoulos, P. Hadjidoukas, C. Papadimitriou, and P. Koumoutsakos*, "Data driven inference for the repulsive exponent of the Lennard-Jones potential in molecular dynamics simulations," **Sci. Rep.-UK**, vol. 7, iss. 1, p. 16576, 2017.
35. *B. Mosimann, G. Arampatzis, S. Amylidi-Mohr, A. Bessire, M. Spinelli, P. Koumoutsakos, D. Surbek, and L. Raio*, "Reference ranges for fetal atrioventricular and ventriculoatrial time intervals and their ratios during normal pregnancy," **Fetal Diagn. Ther.**, 2017.
36. *G. Novati, S. Verma, D. Alexeev, D. Rossinelli, W. M. van Rees, and P. Koumoutsakos*, "Synchronisation through learning for two self-propelled swimmers," **Bioinspir. Biomim.**, vol. 12, iss. 3, p. 36001, 2017.
37. *E. Oyarzua, J. H. Walther, C. M. Megaridis, P. Koumoutsakos, and H. A. Zambrano*, "Carbon nanotubes as thermally induced water pumps," *ACS nano*, vol. 11, iss. 10, p. 9997–10002, 2017.
38. *S. Verma, G. Abbati, G. Novati, and P. Koumoutsakos*, "Computing the force distribution on the surface of complex, deforming geometries using vortex methods and Brinkman penalization," **Int. J. Numer. Meth. Fl.**, 2017.
39. *S. Wu, P. Angelikopoulos, C. Papadimitriou, and P. Koumoutsakos*, "Bayesian annealed sequential importance sampling (BASIS): an unbiased version of transitional Markov Chain Monte Carlo," **ASCE-ASME J. Risk Uncertain. Eng. Sys. B**, 2017.
40. *J. Chen, J. H. Walther, and P. Koumoutsakos*, "Ultrafast cooling by covalently bonded graphene-carbon nanotube hybrid immersed in water," **Nanotechnology**, vol. 27, iss. 46, p. 465705, 2016.
41. *M. Gazzola, A. A. Tchieu, D. Alexeev, A. de Brauer, and P. Koumoutsakos,* "Learning to school in the presence of hydrodynamic interactions," **J. Fluid Mech.**, vol. 789, p. 726–749, 2016.
42. *S. Wu, P. Angelikopoulos, G. Tauriello, C. Papadimitriou, and P. Koumoutsakos*, "Fusing heterogeneous data for the calibration of molecular dynamics force fields using hierarchical Bayesian models," **J. Chem. Phys.**, vol. 145, iss. 24, p. 244112, 2016.
43. *D. Alexeev, J. Chen, J. H. Walther, K. P. Giapis, P. Angelikopoulos, and P. Koumoutsakos*, "Kapitza resistance between few-layer graphene and water: liquid layering effects," **Nano Lett.**, vol. 15, iss. 9, p. 5744–5749, 2015.
44. *P. Angelikopoulos, C. Papadimitriou, and P. Koumoutsakos*, "X-TMCMC: adaptive kriging for Bayesian inverse modeling," **Comput. Method. Appl. M.**, vol. 289, p. 409–428, 2015.

45. *M. U. Baumann, M. Marti, L. Durrer, P. Koumoutsakos, P. Angelikopoulos, D. Bolla, G. Acharya, U. Bichsel, D. V. Surbek, and L. Raio*, "Placental plasticity in monochorionic twins: impact on birth weight and placental weight," **Placenta**, vol. 36, iss. 9, p. 1018–1023, 2015.
46. *J. Chen, J. H. Walther, and P. Koumoutsakos*, "Covalently bonded graphene-carbon nanotube hybrid for high-performance thermal interfaces," **Adv. Funct. Mater.**, vol. 25, iss. 48, p. 7539–7545, 2015.
47. *S. Finley, P. Angelikopoulos, P. Koumoutsakos, and A. Popel*, "Pharmacokinetics of anti-VEGF agent aflibercept in cancer predicted by data-driven, molecular-detailed model," **CPT: PSP**, vol. 4, iss. 11, p. 641–649, 2015.
48. *P. E. Hadjidoukas, P. Angelikopoulos, C. Papadimitriou, and P. Koumoutsakos*, "Π4U: a high performance computing framework for Bayesian uncertainty quantification of complex models," **J. Comput. Phys.**, vol. 284, p. 1–21, 2015.
49. *M. M. Hejlesen, P. Koumoutsakos, A. Leonard, and J. H. Walther*, "Iterative Brinkman penalization for remeshed vortex methods," **J. Comput. Phys.**, vol. 280, p. 547–562, 2015.
50. *F. Huhn, W. M. van Rees, M. Gazzola, D. Rossinelli, G. Haller, and P. Koumoutsakos*, "Quantitative flow analysis of swimming dynamics with coherent lagrangian vortices," **Chaos**, vol. 25, iss. 8, p. 87405, 2015.
51. *P. R. Jones, X. Hao, E. R. Cruz-Chu, K. Rykaczewski, K. Nandy, T. M. Schutzius, K. K. Varanasi, C. M. Megaridis, J. H. Walther, P. Koumoutsakos, H. D. Espinosa, and N. A. Patankar*, "Sustaining dry surfaces under water," **Sci. Rep.-UK**, vol. 5, iss. 1, 2015.
52. *A. Popadić, M. Praprotnik, P. Koumoutsakos, and J. H. Walther*, "Continuum simulations of water flow past fullerene molecules," **The Eur. Phys. J.-Spec. Top.**, vol. 224, iss. 12, p. 2321–2330, 2015.
53. *W. M. van Rees, G. Novati, and P. Koumoutsakos*, "Self-propulsion of a counter-rotating cylinder pair in a viscous fluid," **Phys. Fluids**, vol. 27, iss. 6, p. 63102, 2015.
54. *W. M. van Rees, M. Gazzola, and P. Koumoutsakos*, "Optimal morphokinematics for undulatory swimmers at intermediate Reynolds numbers," **J. Fluid Mech.**, vol. 775, p. 178–188, 2015.
55. *P. B. de Reuille, A. Routier-Kierzkowska, D. Kierzkowski, G. W. Bassel, T. Schuepbach, G. Tauriello, N. Bajpai, S. Strauss, A. Weber, A. Kiss, A. Burian, H. Hofhuis, A. Sapala, M. Lipowczan, M. B. Heimlicher, S. Robinson, E. M. Bayer, K. Basler, P. Koumoutsakos, A. H. Roeder, T. Aegerter-Wilmsen, N. Nakayama, M. Tsiantis, A. Hay, D. Kwiatkowska, I. Xenarios, C. Kuhlemeier, and R. S. Smith*, "MorphoGraphX: a platform for quantifying morphogenesis in 4D," **eLife**, vol. 4, 2015.
56. *D. Rossinelli, B. Hejazialhosseini, W. van Rees, M. Gazzola, M. Bergdorf, and P. Koumoutsakos*, "MRAG-i2d: multi-resolution adapted grids for remeshed vortex methods on multicore architectures," **J. Comput. Phys.**, vol. 288, p. 1–18, 2015.
57. *G. Tauriello, and P. Koumoutsakos*, "A comparative study of penalization and phase field methods for the solution of the diffusion equation in complex geometries," **J. Comput. Phys.**, vol. 283, p. 388–407, 2015.
58. *G. Tauriello, H. M. Meyer, R. S. Smith, P. Koumoutsakos, and A. H. K. Roeder*, "Variability and constancy in cellular growth of arabidopsis sepals," **Plant Physiol.**, p. 2342-2358, 2015.
59. *S. Wu, P. Angelikopoulos, C. Papadimitriou, R. Moser, and P. Koumoutsakos*, "A hierarchical Bayesian framework for force field selection in molecular dynamics simulations," **Philos. T. Roy. Soc. A**, vol. 374, iss. 2060, p. 20150032, 2015.
60. J. *Chen, J. H. Walther, and P. Koumoutsakos*, "Strain engineering of kapitza resistance in few-layer graphene," **Nano Lett.**, vol. 14, iss. 2, p. 819–825, 2014.
61. *E. R. Cruz-Chu, A. Malafeev, T. Pajarskas, I. V. Pivkin, and P. Koumoutsakos,* "Structure and response to flow of the glycocalyx layer," **Biophys. J.**, vol. 106, iss. 1, p. 232–243, 2014.
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SOFTWARE

Over the last 20 years we have developed a number of open source software packages in the areas of Biological Imaging, Machine Learning, Stochastic Optimisation, Particle Methods and Uncertainty Quantification. Links to this software can be found in **http://cse-lab.ethz.ch/software/**

Software packages include:

- **Korali** is a high-performance framework for uncertainty quantification of computational models.
- **smarties** is a distributed Reinforcement Learning (RL) library designed to easily integrate with existing simulation software (python/C++/F90).
- **TScratch** is a software tool to automatically analyze wound healing assays (scratch assays).
- **MorphoGraphX** is a free Linux application for the visualization and analysis of 3D biological datasets.
- **Particle Tracker** is a 2D and 3D feature point-tracking tool.It is embedded in IMAGEJ
- **Cell Image Velocimetry (CIV)** extracts and analyze detailed spatiotemporal information for cell migration, as studied by wound healing assays.
- **Parallel Particle Mesh Library (PPM)** is library for particle and particle-mesh simulations exploiting a unifying formulation for the simulations of discrete and continuous systems using particles
- **Cubism-MPCF** The 2013 Gordon Bell wining code on 3D Finite Volume Simulations for Multiphase Flows *(available on GitHub)*
- **uDeviceX:** The 2015 Gordon Bell finalist on DPD simulations for blood and cell flows in microfluidic devices - The in-silico Lab-on-a-Chip *(available on GitHub)*.
- **CMA-ES:** The Covariance Matrix Adaptation Evolution Strategy (CMA-ES) for Noisy and Global Optimization is an evolutionary (search) algorithm for difficult optimization problems.
- **Pi4U** is an extensible framework for non-intrusive Bayesian Uncertainty Quantification and Propagation of complex and computationally demanding physical models, that can exploit massively parallel computer architectures.

TEACHING:

At Harvard I teach a course in Fluid Mechanics and in Stochastic Modeling and Simulation. ETHZ I have taught several courses in Engineering, Mathematics (Introductory and advanced Numerical Methods, Multiscale Modeling and Simulation) and Computer Science (Machine Learning, first ever class at ETHZ in 2000, High Performance Computing, as well as Introductory Courses for Computational Scientists an Engineers). During my sabbaticals at Caltech and MIT I have taught classes in Flow simulations using Particle Methods and Methods for Computational Science.

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LANGUAGES: English, French, German, Greek